Staff Overview Presentation

California's Bioenergy Action Plan
Public Meeting of the Bioenergy Working Group

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California Energy Commission

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Presentation Outline

- Strategic Value of California's Biomass Resources
- State Policies affecting Bioenergy
- Biomass Industry Status and Market Potential
- Key Market Barriers and Regulatory Issues
- Progress to Plan

Strategic Value of Bioenergy

The U.S. has large, diverse and untapped biomass resources which can support greater use in electric power, fuels and chemicals.
U.S. Potential = 1.3 billion tons
California = 80 million dry tons

Biomass is an energy resource capable of achieving state petroleum reduction, climate change, renewable energy and environmental goals.

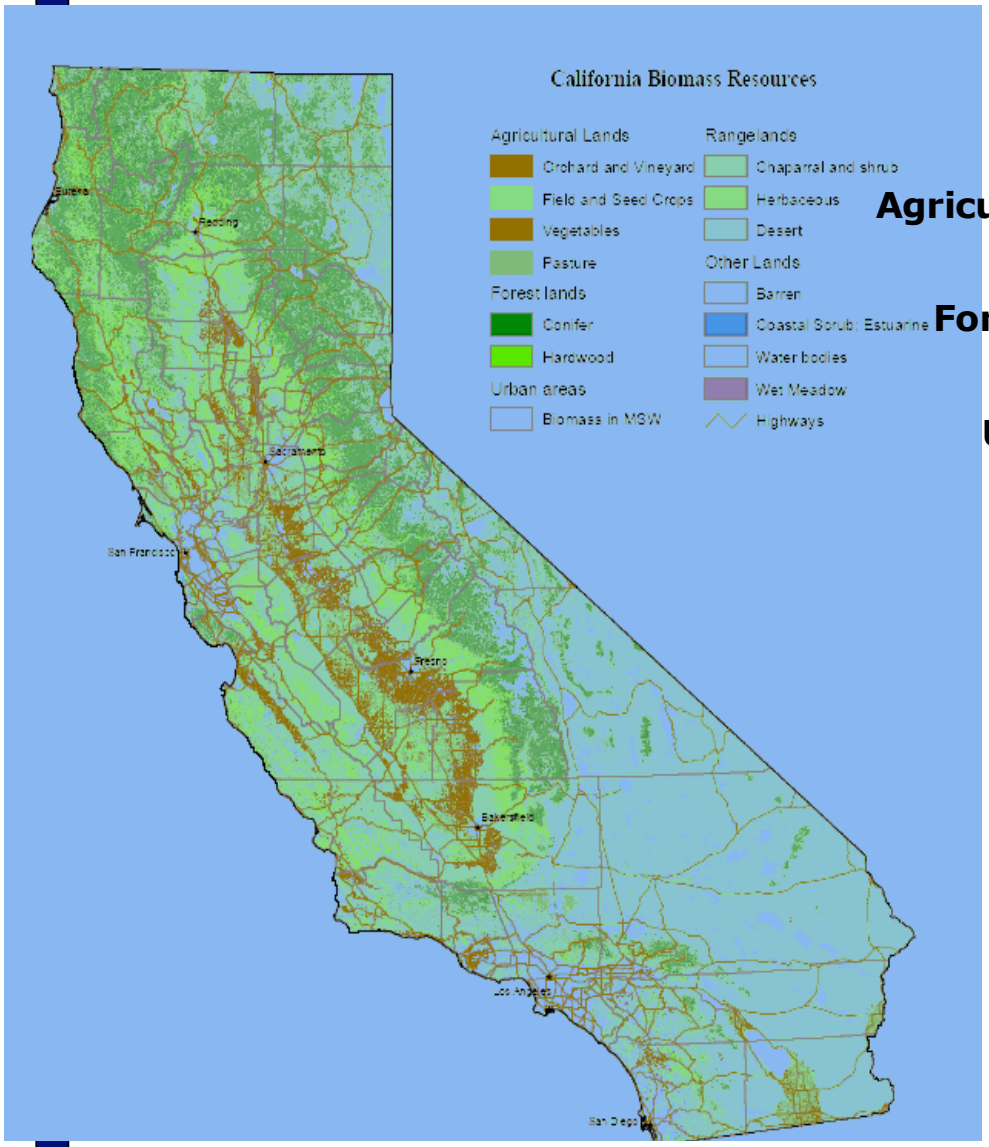
Use of biomass for energy production can address the U.S. and California's waste disposal and environmental problems, while creating local jobs.

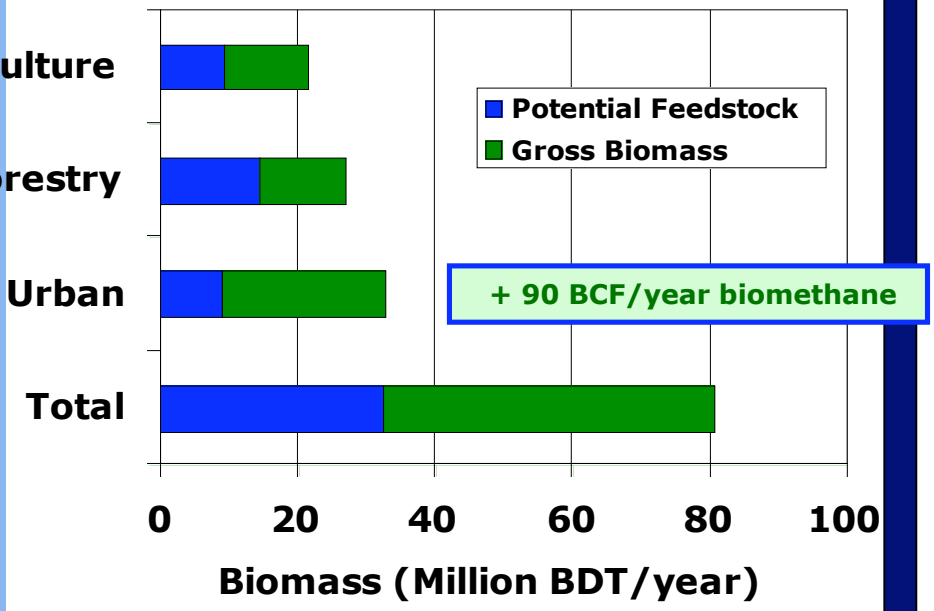
Other public benefits include improving forest health and human and animal health, while avoiding catastrophic wildfires.

Biomass is seen as a Waste Disposal Problem

- Reducing Landfill Capacity
  - About 40 million tons of biomass goes into landfills every year
- Contributing to Air Pollution and Fire Risk
  - Open field burning of crop residues emits more than 100,000 tons of air pollutants annually
  - Wildfires contribute over 1.1 million tons per year at a cost of >$900 million/year
- Local Concerns
  - California's 1.7 million dairy cows generate odor and health concerns

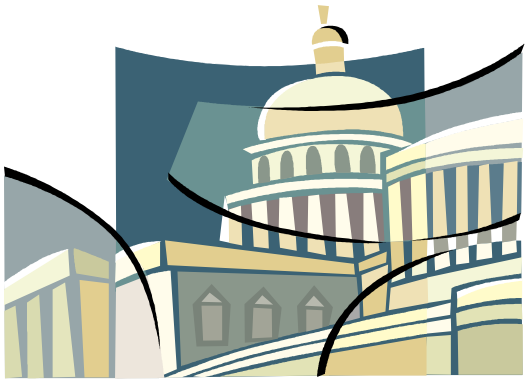
California Biomass Resources





California Government Initiatives

- In April 2006, Governor Schwarzenegger signed Executive Order S-06-06, directing state agencies to develop a consistent state policy to promote sustainable biomass production and use.
- In July 2006, the Governor released the State of California's Bioenergy Action Plan.
- The Governor has directed the Bioenergy Interagency Working Group, composed of nine individual state agencies, to carry out the Plan.
- The Governor signed Assembly Bill 32, the Global Warming Solutions Act of 2006, and subsequent Executive Order, establishing a Low Carbon Fuel Standard.



Governor's Executive Order S-06-06 on Biomass

On April 25, 2006, the Governor signed an Executive Order, establishing targets to increase in-state production and use of bioenergy, including ethanol and bio-diesel fuels made from renewable resources:

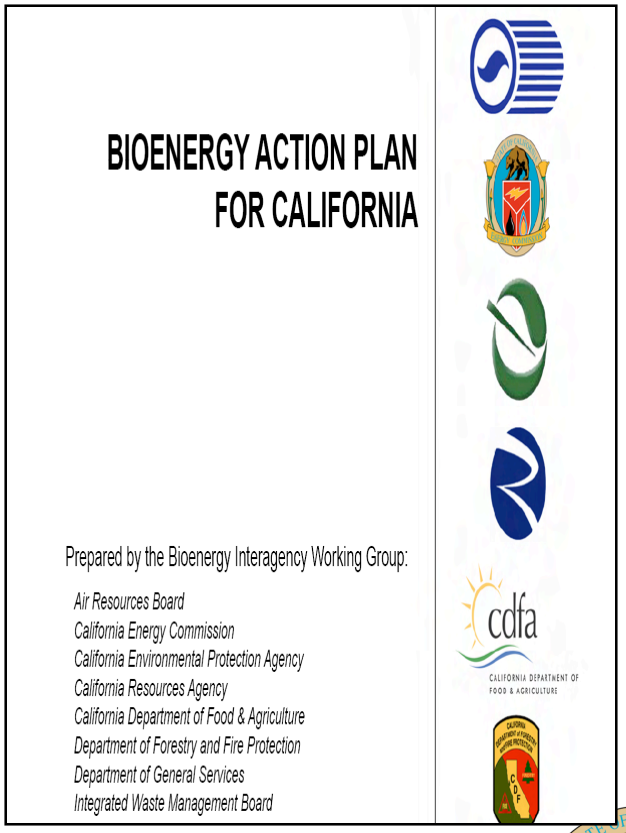
- **For biofuels**, the state shall produce a minimum of 20 percent of its biofuels within California by 2010, 40 percent by 2020, and 75 percent by 2050.

- **For biomass for electricity**, the state meet a 20 percent target within the established state goals for renewable generation for 2010 and 2020.

Bioenergy Action Plan

In July 2006, the Governor publicly released the State of California's Bioenergy Action Plan in order to:

- **Coordinate research, development, demonstration, and commercialization efforts across federal and state agencies.**
- **Align existing state regulatory requirements to encourage production and use of California's biomass resources.**
- **Facilitate California as a market leader in technology innovation and market development**
- **Encourage market entry for new applications of bioenergy, including electricity, biogas, and biofuels.**
- **Maximize the contributions of bioenergy toward achieving multiple state policy goals of petroleum reduction, climate change, renewable energy, and environmental protection.**



Part Two: Progress to Plan

- What progress is being made toward achieving the Governor's bioenergy targets?
- What is the current status of California's biomass, biogas and biofuels industry?
- What actions is the Energy Commission taking to promote sustainable bioenergy development?

California Bioenergy Status

- Biomass power facilities produce ~1,000 MW of electrical capacity:
  - **Combustion of Forestry, Agricultural and Urban Residues for Power**
  - **Convert Methane Rich Landfill Gas to Energy**
  - **Construct Wastewater/ Dairy Biogas Systems that process Biogas.**
- Biofuels - Californians consumed over 900 million gallons of ethanol and over 43 million gallons of biodiesel in 2006.

Total Categorical Bioenergy Potentials in California

Category	Biomass (Million BDT/year)	Energy in Product (Trillion Btu/year)	Total Capacity
Electricity CHP Heat	32	118 (35 TWh) 230	4,650 MWe 9,050 MWt
Biochemical Biofuel	32	188	1.5 BGY gasoline equivalent
Thermochemical Biofuel	27*	250	1.7 BGY diesel equivalent
Biomethane	5 + Landfill gas and WWTP	106	90 BCF/y methane
Hydrogen (bio + thermal)	32	305	2.5 Million tons/y

* Tonnage for thermochemical biofuel assumed to be constrained by moisture content.

Current California consumption:

16 billion gallons gasoline + 4 billion gallons diesel = 2,500 Trillion Btu/year direct energy content

300 TWh/y electrical energy = 1,024 Trillion Btu/year direct energy

In-state Production and Use Goals

Increase <u>in-state</u> production and use of bioenergy, including ethanol and bio-diesel fuels made from renewable resources:

- **For biofuels**, the state shall produce a minimum of 20 percent of its biofuels within California by 2010, 40 percent by 2020, and 75 percent by 2050.

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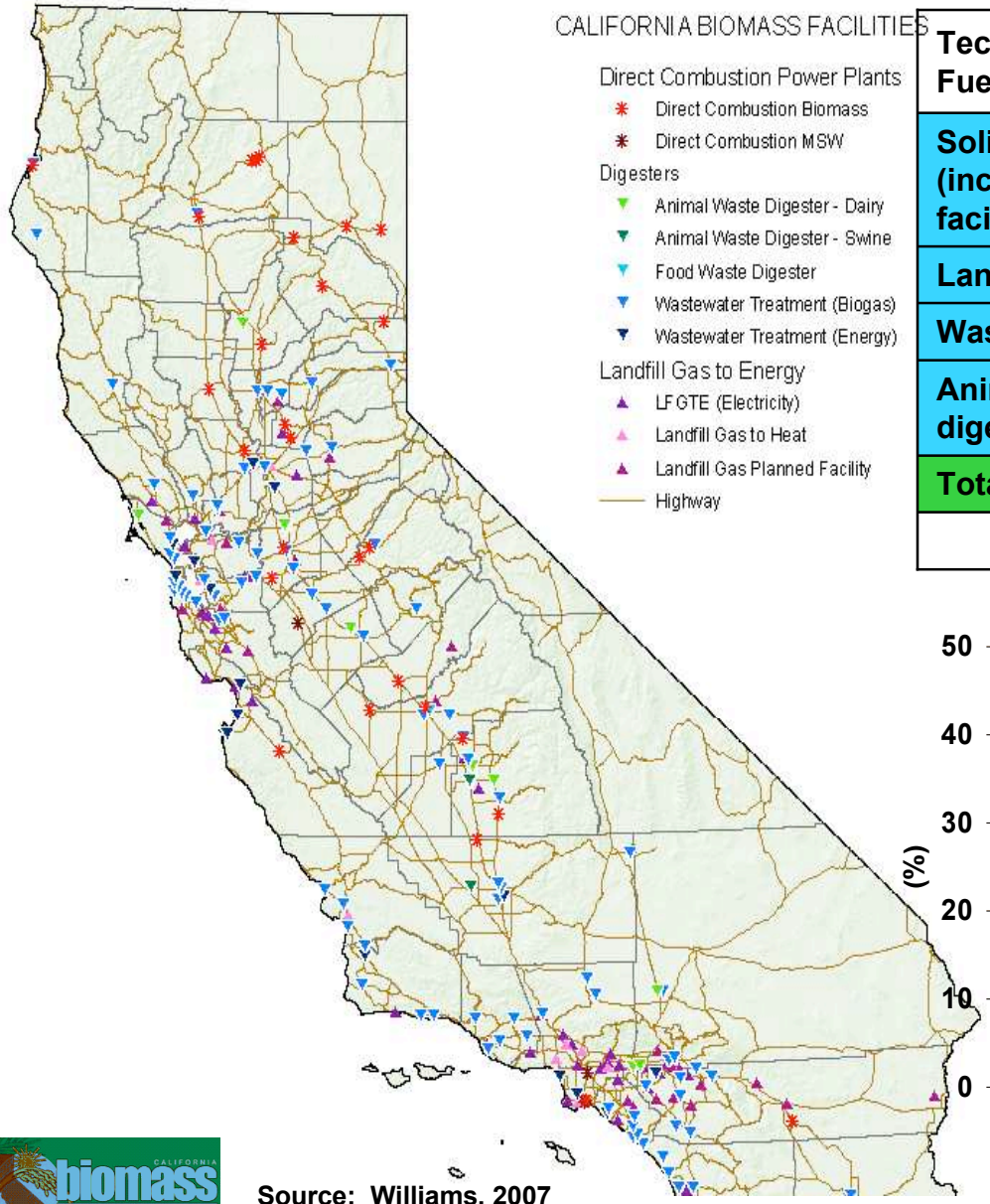
California Energy

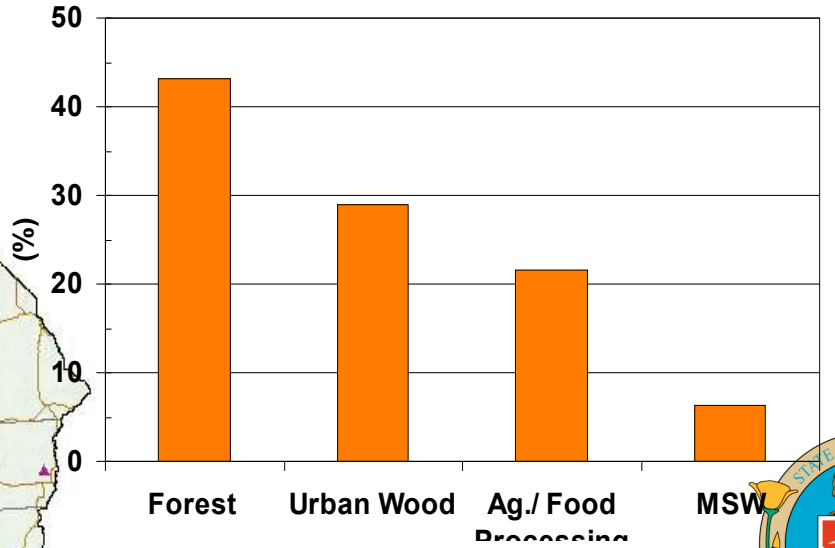


Current Biomass Power Capacity in California

Technology/ Fuel Source	Number of facilities	Gross Capacity (MW)
Solid Fuel Combustion (includes 3 MSW facilities)	30	640
Landfill gas-to-energy	60	275
Wastewater treatment *	20	64
Animal and food waste digester	22	5.7
Totals	132	985

* Suspect - Probably higher

Solid Combustion Fuel Sources



Source: Williams, 2007

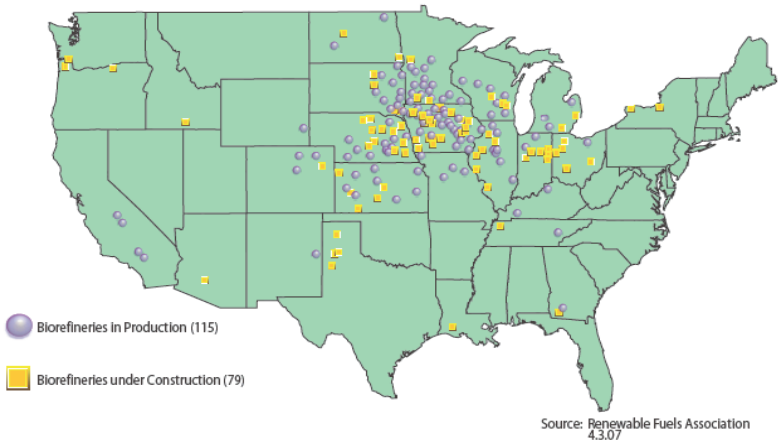
Biomass needed to meet goal of a 20% share of the State Renewables Portfolio Standard (RPS)

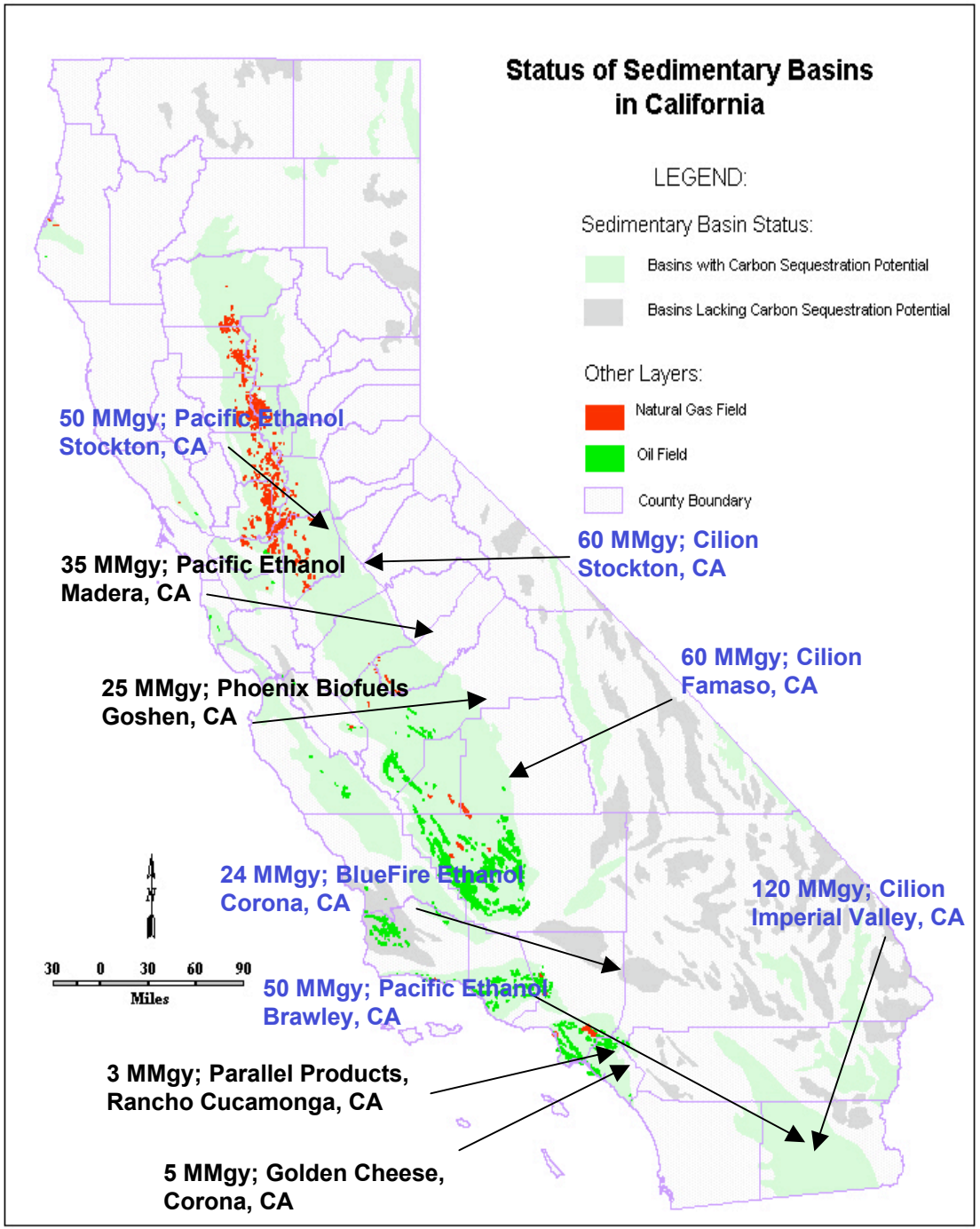
	RPS (%)	Renewable power under RPS (GWh/y)	20% Biomass goal (GWh/y)	Biomass capacity required above current 2005 (MW- 0.85 cap. Factor)
2010	20	58,575	11,700	575
2020	33	109,400	21,875	1,975
2050	33	136,500	27,300	2,670

Ethanol Locations in California (2006)

- Existing ethanol facilities (68 Million Gallons)
- **Proposed** plants (364 Million Gallons)

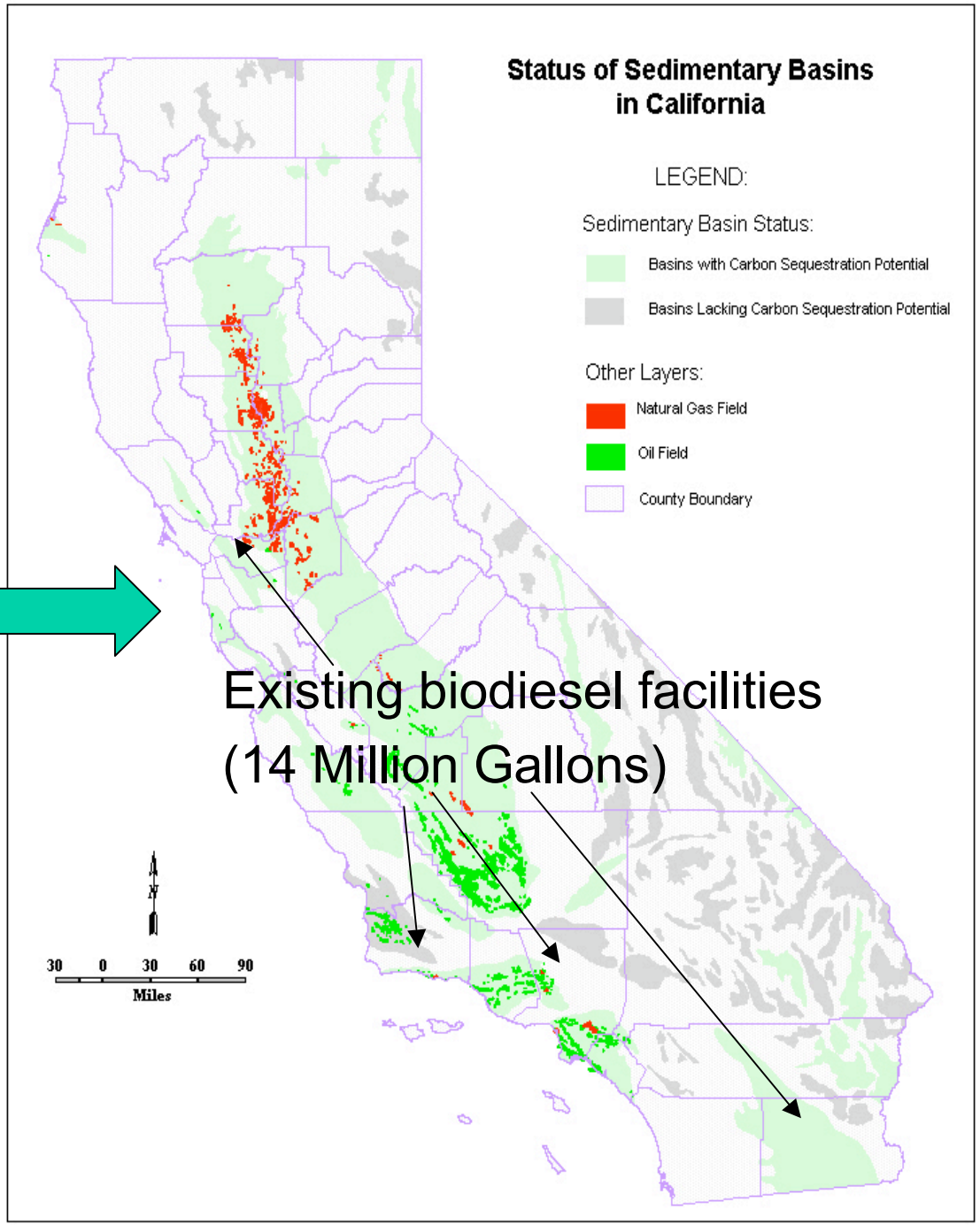
U.S. Ethanol Biorefinery Locations





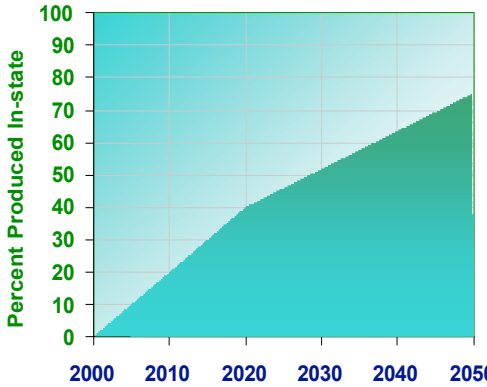
Biodiesel Consumption in California (2006) 43 Million Gallons

Biodiesel imports
(29 Million Gallons)



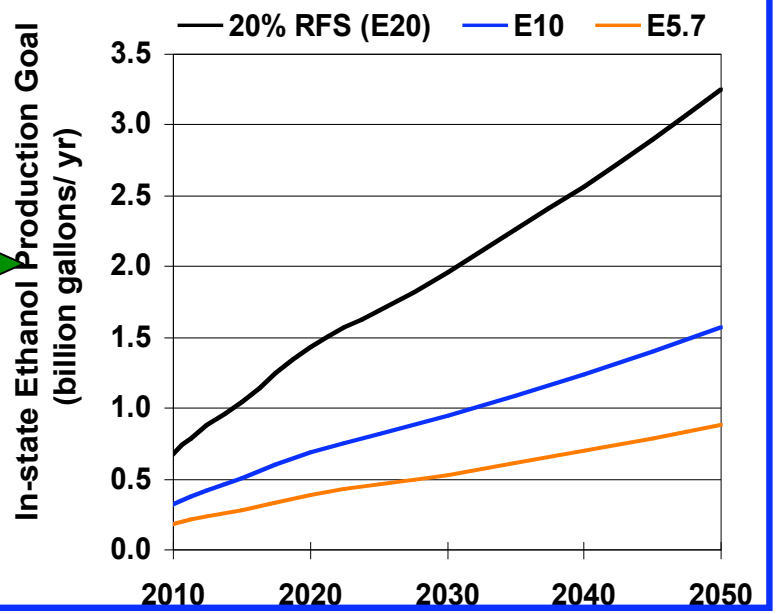
In-state biofuel production goals for blend rate scenarios

- Assuming projected transportation fuel growth rates and
- Executive Order S-06-06 goals for in-state biofuel production
  - 20% by 2010
  - 40% by 2020
  - 75% by 2050

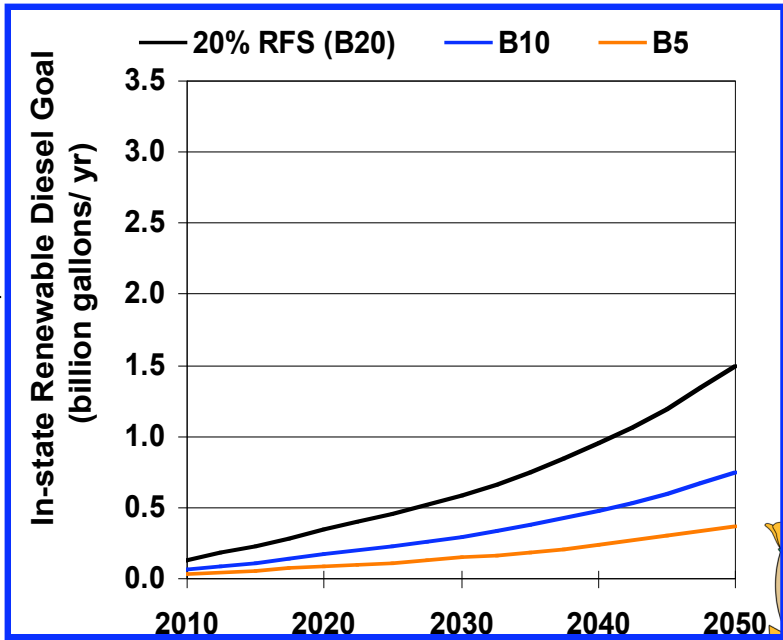


Source: Williams, 2007

Ethanol



Renewable Diesel



Progress to Plan
Energy Commission Actions

- Completed a comprehensive “road map” to guide future state level RD&D activities.
- Prepare the Alternative Fuels Plan, as required by Assembly Bill 1007, by June 30, 2007.
- Report on progress toward achieving the Governor’s goals in our Integrated Energy Policy Report.

California Biomass Roadmap

***Vision*: Sustainable biomass resources energize a healthy and prosperous California through the environmentally beneficial production and use of renewable energy, bio-fuels, and bio-products.**

Priority research areas:

1. Resource access and feedstock markets and supply
2. Market expansion, access, and technology deployment
3. Research, development, and demonstration
4. Education, training, and outreach
5. Policy, regulations, and statutes

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CALIFORNIA biomass

STATE OF CALIFORNIA
ENERGY COMMISSION

State Alternative Fuels Plan

The Governor signed Assembly Bill 1007 (Chapter 371, Statutes of 2005) in September 2005, requiring the Energy Commission to:

- Develop and adopt a State Plan to Increase the Use of Alternative Fuels no later than June 30, 2007.
- Plan will recommend goals, regulations, incentives and policies to increase use of alternative fuels.
- Work in partnership with the Air Resources Board and affected state agencies.
- The Energy Commission has a proceeding underway to complete the Plan.
- Plan will be adopted by the Commission on June 27, 2007 and submitted to the ARB for consideration.

Biomass RD&D Activities

- Technology Development
  - Direct Combustion/Co-firing Systems
  - Biogas
  - Thermal Gasification and Pyrolysis
  - Biofuels and Biorefineries
- Analysis and Planning
  - California Biomass Collaborative Support
    - Biomass Roadmap for biomass development
    - Biomass Resource Assessments
    - Biomass Performance Reporting System
  - Strategic Value Analysis
    - Linking cost competitive biomass resources to electricity system needs while addressing public benefits
- Natural Gas Replacements by Biomass
  - Implement Natural Gas RD&D Program Plan
  - PIER Transportation RD&D

Renewable Energy Program
Production Incentives for Biomass

- **Existing Renewable Facilities Program**
  - Has helped 33 biomass facilities remain competitive or return to service by paying more than $150 million for 640 MW of renewable energy capacity
  - Provided $6 million for the 2004 Agriculture-to-Biomass Program to improve air quality in CA's agricultural areas
- **New Renewable Facilities Program**
  - Of the 68 participating "new" renewable generating facilities, 20 are biomass projects
  - 17 biomass facilities have been completed and are producing electricity representing 50 MW of capacity
  - More than $14 million in payments has supported 1,201 gigawatt-hours of biomass generation
  - When completed, all 20 biomass facilities will bring 64 MW of new renewable capacity to California's electricity grid

Renewables Portfolio Standard (RPS)

- **Investor Owned Utility RPS Biomass Contracts**
  (signed since 2002)
  - As of March 22, 2007, RPS solicitations and bilateral agreements have resulted in signed contracts with biomass facilities for 285 - 391 MW of capacity (range reflects build-out options).

- **RPS Certification**
  - 96 biomass facilities are certified and 21 are pre-certified as eligible for the RPS representing 1,819 MW of capacity.

Biofuels Demonstration Program

- Funding of $3 million awarded in 2007 to advance energy conversion technologies using cellulose biomass:
  - Metcalf & Eddy and San Francisco Public Utility Commission: Brown Grease Recovery and Biofuel Production Demonstration
  - Renewable Energy Institute International: Demonstration of an Integrated Biofuels and Energy Production System
  - Bluefire Ethanol: First California cellulose to ethanol biorefinery project.
- Agricultural and forest residues, urban waste, and food waste, beverages, waste grease, and purpose-grown energy crops for fuel production qualify under this program.

Energy Efficiency and Renewable Generation Agricultural Loan Program

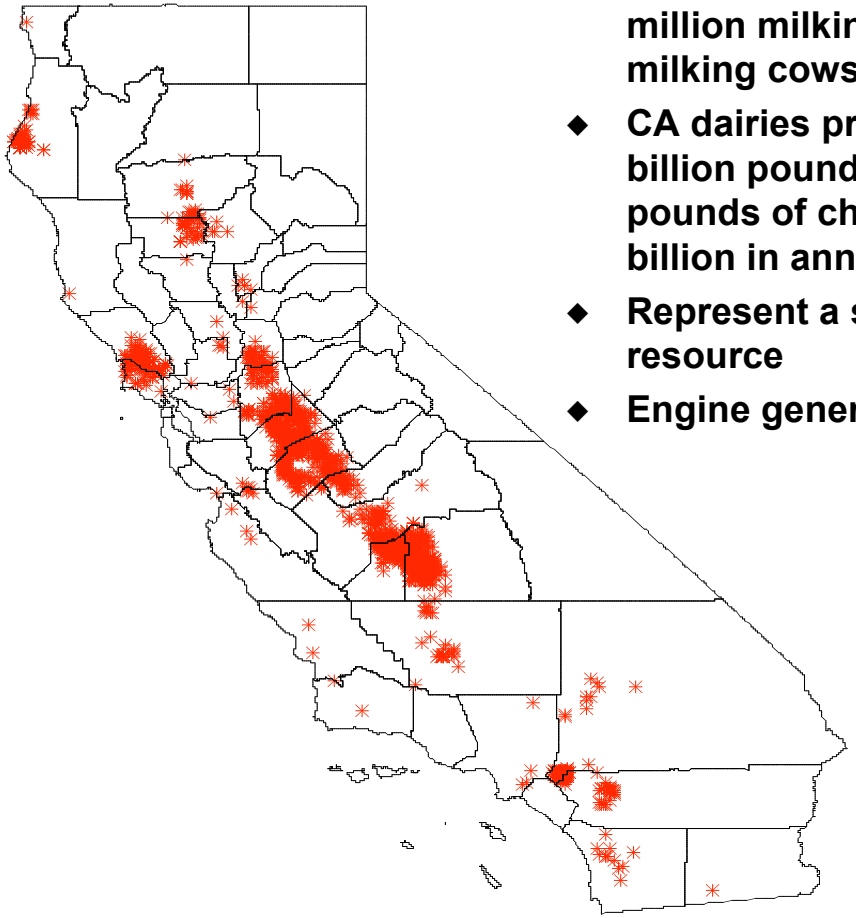
Available Funds: approximately $3 million for an Agricultural and Food Industries Loan Program; Interest Rate: 3.2%

Maximum loan amount: $500,000 for a single project or multiple projects.

Funds are available for the design, purchase and installation of the eligible BioEnergy technology.

Open solicitation, first-come-first-serve.

Distribution of Dairies in California



- California is home to about 1.7 million milking cows – 18% of U.S. milking cows
- CA dairies produce more than 27 billion pounds of milk, 1.25 billion pounds of cheese and generate $3 billion in annual sales
- Represent a significant bioenergy resource
- Engine generators at 10 CA dairies

Dairy Power Production Program

Biogas Digesters Installed at 10 Dairies in California & more to come

- **10 systems funded ~ generating 2.5 MW total**
- **5 covered lagoons and 5 plug flow digesters**
- **6 new and 4 refurbished digester systems**
- **Lactating cows range from 245 to 7,931**
- **Dairy manure or mixture of dairy manure with cheese wastewater, creamery wastewater, and food processing wastewater**

Key Questions for Today's Discussions

- How can key market barriers must be overcome? Is new technology needed to reduce costs? Is there unfair competition for limited fuel supply?
- What regulatory issues should be addressed? How can competing state policy objectives be balanced and reconciled?
- What additional state actions are needed in the short-term to achieve the Governor's goals?